not known. We sought to determine if cardiogenic emboli have a random distribution or if there are factors that predict site of embolization, limb salvage and mortality.

Methods: Upper (UE) and lower extremity (LE) emboli were evaluated over a 6 year period. Demographic (age, gender, smoking, medical comorbidities) and echocardiographic data were analyzed to determine predictors of embolic site. All patients underwent surgical revascularization. Limb salvage and mortality were compared with Kaplan-Meier analysis.

Results: 160 patients (72 male, 88 female) with presumed cardiogenic emboli were identified, 56 UE (35 right, 21 left) and 104 LE (42 right, 44 left, 18 bilateral). Men had significantly higher LE emboli than females (76% vs 56%) and females more UE (44% vs 24%; $P = .01$). No other demographic factors were statistically different. UE patients were more likely to have atrial fibrillation on admission (50% vs. 30%; $P = .04$), while there was a trend towards LE patients having a higher percentage of aortic or mitral valvular disease (47% vs 31%; $P = .06$). 30 day limb salvage was higher for UE compared to LE (100% vs 88%; $P = .008$) There was a trend toward higher 30 day mortality in the LE group (14% vs 5%; $P = .08$). One year mortality in both groups was approximately 25%.

Conclusions: UE emboli are more frequent in women and patients with active atrial fibrillation. LE emboli are more frequent in men and patients with valvular disease, and are associated with increased 30 day limb loss and mortality. These findings suggest gender- and cardiac-specific differences in patterns of blood flow leading to preferential sites of peripheral embolization.

Beyond Arterial Stenosis: Walking Disability in PAD Patients Is Related to Arterial Endothelial Function

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Objectives: Patients with peripheral artery disease (PAD) have varying degrees of walking disability that do not completely correlate with ankle brachial index (ABI) or angiographic anatomy. We hypothesized that endothelial function (EF) is an independent predictor of symptom severity in PAD patients.

Methods: This was a prospective cohort study of PAD patients (n = 100) presenting to a vascular surgery clinic. All patients received ABIs and brachial artery flow-mediated, endothelium-dependent, vasodilation (FMD) to assess arterial EF. PAD severity was assessed by the clinical Rutherford score. Demographic, biochemical and physiologic parameters were entered into regression equations to determine association with disease severity.

Results: Mean age was 66.3 ± 8.2 and 43% had diabetes. Mean FMD was 7.3% indicating impaired EF. EF progressively declined as Rutherford score increased ($P < .0001$). Diabetes mellitus, albumin, CRP, homocysteine, total cholesterol, and hgbA1c, were all associated with Rutherford score (all $P < .05$). After multivariable regression, EF ($P < .0001$), ABI ($P < .0001$), and total cholesterol ($P = .033$) were predictive of walking disability. Combined, EF, ABI, and total cholesterol account for 50% of the variability in Rutherford scores. However EF and ABI were not correlated indicating that they are independent predictors of disability. When the cohort was restricted to claudicants (n = 81), EF was equally predictive of walking disability. Homocysteine was inversely associated with EF ($P = .024$). Patients with hyperhomocysteinemia (>15 μmol/L; n = 41) had lower EF ($P = .04$) and higher Rutherford scores ($P = .017$) than those without.

Conclusion: Symptom severity in PAD is multifactorial, reflecting both impaired hemodynamics and vascular dysfunction. This is the first demonstration that walking disability in PAD is associated with arterial EF. Endothelial dysfunction in this cohort may be related to homocysteine-dependent mechanisms by reducing bioavailable nitric oxide.

Prospective Evaluation of Tissue Perfusion in Patients with Peripheral Arterial Disease Using Laser-Assisted Fluorescent Angiography

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Objectives: Laser-assisted fluorescent angiography (LAFA) has been used by many specialties to evaluate end organ tissue perfusion. We hypothesize that LAFA can be a valuable tool to qualitatively and quantitatively assess distal perfusion in patients with peripheral arterial disease (PAD). Using this technology we prospectively evaluated PAD patients pre- and postvascular interventions.

Methods: Patients undergoing interventions for PAD were prospectively recruited into this IRB approved pilot study. Plantar pedal perfusion was analyzed pre- and postvascular intervention using the SPY Elite® LAFA system (Lifecell Corporation©). Topographical and fluorescent images were obtained for each patient pre- and postvascular intervention (Fig). Peak pedal perfusion and ingress slope (rate of inflow) were derived from the recorded images. Ankle brachial indices (ABIs) were also evaluated pre- and postintervention. Statistical analysis was performed using Student's *t*-test and Pearson correlation.

Results: Twenty-seven patients with PAD comprised the study population, with an average age of 68. The majority of patients had Rutherford class 5 critical limb ischemia (55%) and one vessel tibial runoff (61%). The majority of patients underwent endovascular femoral and popliteal interventions (88%). Postintervention significant increases were seen in pedal fluorescent ingress slopes ($P = .03$) and a similar increase in ABIs ($P = .001$). Peak pedal perfusions increased in 66% of patients by an average of 45.8%. Both peak pedal perfusion and ingress slope correlated with postintervention ABI (R^2=.56 and R^2=.58, respectively). Peak pedal perfusion and ingress slope also demonstrated a moderate correlation (R^2=.75).

Conclusions: This prospective pilot study demonstrates feasibility and utility of LAFA in the perioperative evaluation of PAD patients. Qualitative and quantitative fluorescent images provide real-time and objective assessments of pedal tissue perfusion. LAFA-derived peak pedal perfusion and ingress slope provide objective measurements of tissue perfusion that correlate with conventional methods using ABIs. With further study, we anticipate that this technology may be a helpful adjunct for intraoperative decision making and predicting wound healing capacity.

Superficialization of the Brachial Artery: An Appraisal of Its Value for Vascular Access

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Objectives: The Japanese Society for Dialysis Therapy recommends superficialization of the brachial artery (BA) as an alternative vascular access (VA) technique in patients for whom a conventional internal shunt (AVF or AVG) cannot be created. Although 2-3% of Japanese hemodialysis patients undergo this procedure, it is not well recognized worldwide. We report here our experience with the procedure, as well as indications, durability, and morbidity.

Method: The technique involves exposure of the BA and ligation of the side branches, then fixing it beneath the skin at the upper arm. Cannulation of the BA is performed 2 weeks or more after surgery and it is used as an outflow route, with any vein in an upper extremity utilized for blood return, including the hand if sites in the arm are not accessible. We retrospectively reviewed our cases of superficialization of the BA for VA.

Results: From 2005-2008, a total of 24 patients (11 females [46%], average age 69 years [range, 39-84 years]) underwent superficialization of the BA, of whom 8 (33%) had diabetes. The indications were (1) impaired cardiac function (n = 13), (2) no other prospect for AVF or patient refused prosthetic graft implantation (n = 5), (3) severe upper extremity arterial disease or ischemic steal syndrome requiring AVF closure (n = 3), (4) venous hypertension with central vein occlusion (n = 2), and (5) repeated AVF thrombosis due to heparin-induced thrombocytopenia (n = 1). The mean follow-up period was 28 months. Serious complications were seen in 1 patient with an infected pseudoaneurysm formation associated with a BA puncture, which necessitated BA ligation, while we also had difficulty finding a vein for blood return in 5 patients. The rate of superficialized BA patency as a functioning VA was 95% and 66% at 1 and 3 years, respectively.

Conclusions: Superficialization of the BA was found to be a simple and safe technique, with acceptable durability and complication rate in selected Japanese hemodialysis patients. We consider that this shuntless VA permits adequate blood flow and has theoretical advantages for some patients, particularly those with impaired cardiac function, though the availability of a return vein is a prerequisite for a functioning VA.

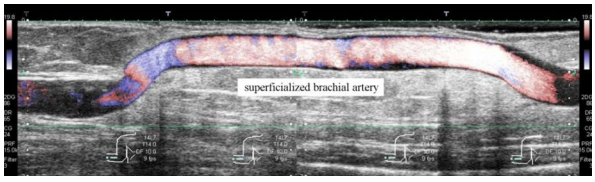

Fig.

Long-Term Outcomes with Arteriovenous Fistulas in a Pediatric Population

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